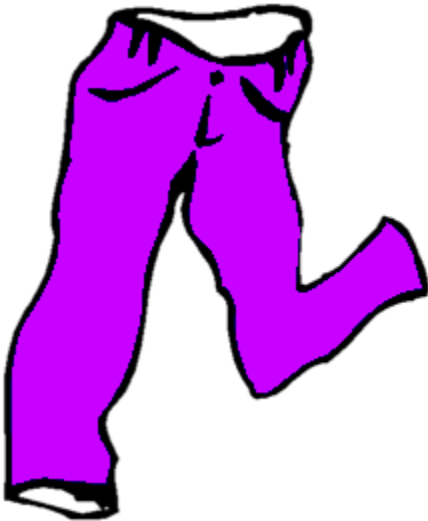


Explorations in Economic Supply, Part I

Concepts covered: law of supply, fixed and variable resources, fixed and variable costs, law of diminishing returns, change in technology, change in resource prices.

If you don't know about the demand for goods, please start with the EcEdWeb demand analysis at the end of this document.

Your friend Bob, who could barely afford to buy bluejeans (see the demand analysis), decides he wants to be an entrepreneur and buy a plant to produce blue jeans. [Company L](#) does quite well, right? So why not get "into jeans" himself? After a brief market analysis, Bob makes his first good decision: not to attempt to



differentiate his product by specializing in fuchsia colored denim jeans. So **blue** denim jeans it will be, and he has many things to think about before opening the doors on this production operation! He has asked you to be his business partner and to help him examine some of the decisions that have to be made. Although you both have some important investment decisions and expected return calculations to make about the purchase of the plant and equipment itself, those are beyond our concerns here. For more information about small businesses, you can check out one of the sites about this topic, for example, [Small Business Administration](#) or [Online, Inc.](#).

In these web pages, we'll restrict the analysis to your decisions about *how many pairs of jeans you would be willing to supply, i.e., offer for sale*. What determines how many pairs you might produce and offer for sale each month from this plant? As in the investigation of demand for blue jeans, there are several considerations that the **buyer** or **demand**er will take into account. Likewise, you as **producer** and **seller** must also consider several things when making the decision about how many pairs of blue jeans to offer for sale.

As in the demand analysis, the price of the product will be one of the most important determinants of how many you offer for sale. Why? Let's start with a common sense approach. Your objective is to earn a profit ("maximize profits"), where profits are the difference between your total revenue and total cost. Since the sale price of a good is your revenue per each unit sold, **a higher price encourages you as seller to produce and offer for sale more pairs of jeans**. This "*Law of Supply*" is common sense, but

there are also some specific reasons for the positive relationship between **quantity supplied** and **produce price**. The most important reason has to do with what happens to **unit costs** (costs of producing one unit), and productivity of producing and selling jeans, which we will analyze in Part II.

Are there other conditions that might affect how much you offer for sale? What are the other influences or **NON-PRICE DETERMINANTS of supply**? What if **TECHNOLOGY CHANGES**--for example, you discover a new device for sewing machines that increases productivity (increases the number of blue jeans that can be made per hour)? Or perhaps you have to pay higher **RESOURCE PRICES** (e.g. wages). If the jeans had a special government **TAX** or **SUBSIDY**, that would also influence the supply relationship. If your **EXPECTATIONS ABOUT THE PRICE** of jeans is that they will be much higher next month, that would influence how many you offer today. Finally, if you produced other goods (e.g. shirts) using the same resources, the **PRICE OF THE OTHER GOODS PRODUCED** would influence the supply of jeans. Sounds like all of these are important!

Summary so far:

Price is an important determinant of the quantity of a good supplied. The "**Law of Supply**" states that the amount offered for sale rises as the price is higher (given the non-price determinants). The quantity of pairs of jeans you are willing to offer for sale rises as their price is higher primarily because you need to cover the rising costs of production in your plant. Let's explore that in Supply, Part II.

In Part II, we will explore the relationships among productivity, costs, and price. We will develop a **supply curve without** considering changes in the other (non-price) determinants of supply: technology, resource prices, taxes or subsidies, expectations, and the price of other goods produced by the same seller. We will "hold constant" these other determinants in Part II to highlight the role of the impact on costs as output changes. But of course these other influences do change, so in Part III, we take up the matter of changing the other conditions surrounding production: technology, resource prices, taxes or subsidies, expectations, and the price of other goods produced by the same seller.

For Discussion

Consider the major influences or determinants of supply to make decisions about how much to produce and offer for sale.

1. What are these determinants of the amount supplied?
2. What will happen to the quantity of jeans you will supply if the price goes down (and other determinants are constant)?

When you have finished, you are ready for the analysis section in Part II.

Explorations in Supply, Part II

Goal of Part II: work out the *supply curve* (relationship between price and the quantity supplied) **without** considering changes in the other determinants of supply discussed in Part I (no changes in technology, resource prices, taxes or subsidies, expectations, and the price of other goods produced by the same seller). So suppose these other things don't change (until Part III). Under those circumstances, why would it take a higher price to encourage you to supply a higher quantity of goods?

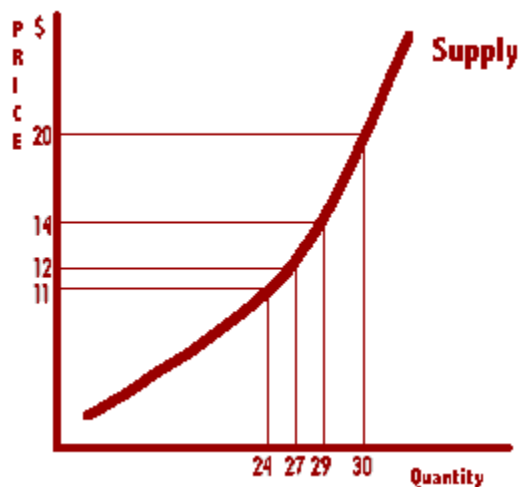
Let's start with a bit more information about your potential blue jeans production operation and apply some basic economic cost ideas. If you go through with the purchase, you will have a plant (building) and some equipment--for example, sewing machines. This is the capital stock when your enterprise opens its doors. Economists separate supply analysis into the *short run* and *long run*: in the short run, your plant and equipment is a fixed or constant and thus is a limiting factor of your production. In the long run, none of the factors of production are fixed so you could expand or contract the size of the plant and equipment. **Thus, the short run is not defined in terms of months or years, but as a period of time certain production conditions hold constant.** Since you and Bob are considering a particular building and set of equipment for this analysis, your analysis should be "in the **short run**". Later, if things go well, you might want to expand, but for now we are limited to the given resources. Roughly speaking, the costs associated with these fixed resources are called **fixed costs**.



What else do you need to produce blue jeans? Of course--to produce the jeans, you'll need some employees to work with the equipment. Here you have more options. You figure that you can hire any number of employees that you might want at the same wage rate per hour. You could hire only one person, who would have to run around like a dervish from one piece of equipment to another trying to keep production going, or you could hire more employees to keep the plant running smoothly, or you could hire a whole crowd of employees to run the plant at highest capacity, perhaps even 24 hours per day. In this last case, you might have so many employees that they get in each other's way, not to mention the heavy wear and tear on the equipment from running continuously. Since your labor force is not "fixed" in number of employees, labor is a **variable resources** and labor cost is part of your **variable cost**.

These costs rise (beyond some point) as production increases because of the "**Law of Diminishing Returns**," e.g., the last unit of variable resource (worker) added to fixed plant and equipment is less productive than the unit added just before. This is not because of any lack of skills or other defect of the new worker. Also, it does not mean that this particular new worker produces less than the other workers produce **after** the new worker starts the job! The decline in marginal output occurs because each and all workers have less fixed capital (plant and equipment) to work with after more workers are added, beyond a certain point, of course. Now to the point about supply and price: **Since the objective of the producer/seller is to earn a profit, the rising marginal cost per unit as more is produced causes the seller's required product price to rise.**

If you would like to delve into some numbers illustrating the Law of Diminishing Returns and marginal costs, an addendum has been provided for you to digress to at this point. Otherwise (or if you went, welcome back), let's go on to show the supply data and the supply curve.



Supply Data	
Price	Quantity Supplied
\$11.00	24
\$12.00	27
\$14.00	29
\$20.00	30

This supply data is shown as a supply curve in the diagram. The curve shows what you've just figured out: a higher price is required for a higher quantity of output to be supplied, i.e., the **Law of Supply**. We could also say that **the supply curve is positively sloped, showing a positive relationship between price and quantity supplied.**

For Discussion

1. Why is the supply curve positively sloped? What do the Law of Diminishing Returns and productivity have to do with the supply curve? What does this mean for the relationship between price and quantity supplied?

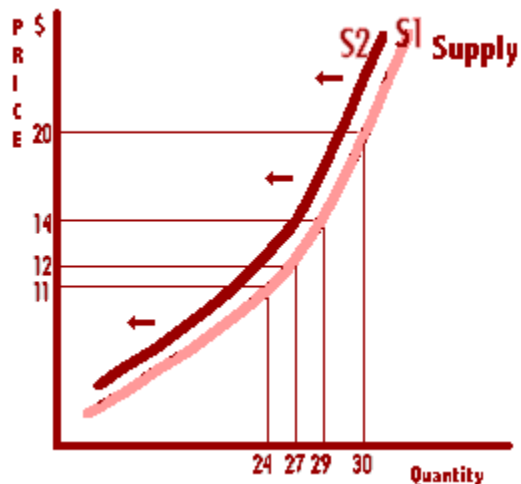
When you have finished, you are ready to consider what happens when supply determinants other than price change, as discussed in Part III.

Explorations in Economic Supply, Part III

Nice going! You and Bob, co-owners of the new bluejeans finishing plant, have figured out how important the selling price is in your decisions about how many pairs of bluejeans to supply. And you are certainly aware that other determinants of supply are important too! Indeed, changes in technology, resource prices, taxes or subsidies, expectations, and the price of other goods produced by the same seller are no less important as changes in price.

Oh oh! The \$12 wage rate at which you started to hire labor is not enough to hire the level of skills that you need. It appears that you are going to have to pay at least \$16 per hour for the workers hired. Using the same other assumptions as before, how will this affect the amount you are willing to sell? The supply curve is still critical, but clearly it won't be the same supply curve as we used before. The production levels from hiring resources is the same as before and so is the productivity of labor. You just blew it when you estimated the going wage rate!

Changes in these determinants of supply result in a new supply curve, and we say that the supply curve has **SHIFTED** from the initial position to the new position. Here are the old and new supply relationships for our wage increase. The lighter curve is the original supply curve labelled S1. The darker curve S2 shows how the supply curve changes after the higher wage.



Supply Data		
Price	Price	Quantity Supplied
(wage \$12)	(wage \$16)	
\$11.00	\$12.00	24
\$12.00	\$13.30	27
\$14.00	\$16.00	29
\$20.00	\$24.00	30

We could view the **SHIFT** in the supply curve as showing that it takes a higher price to provide the same quantity (as the table shows). **Also note that the diagram also**

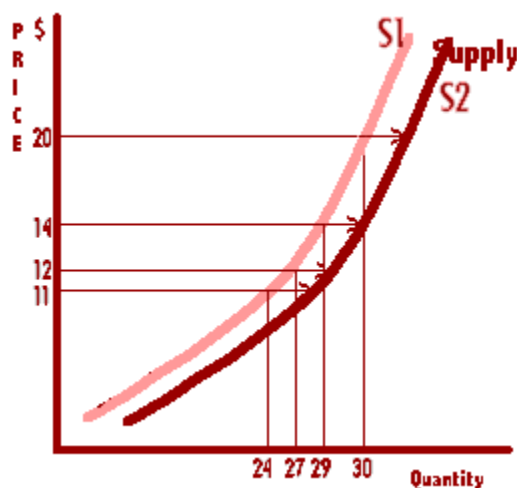
shows that, for a particular price, say \$14.00, a lower amount of the product will be supplied with the new supply curve. We use different ways to describe

(a) a movement along a constant supply curve, which only happens when the price changes, and

(b) a change in the position of the supply curve, which happens when a non-price determinant changes.

We use some specific language to clarify which of these is going on: A **CHANGE IN QUANTITY SUPPLIED** means that only the **price** has changed and a new quantity is supplied along a constant supply curve. A **CHANGE (DECREASE OR INCREASE) IN SUPPLY** or a **SHIFT IN SUPPLY** means that a change in amount supplied occurs because of a change (shift) in the position of the supply curve. This **SHIFT IN SUPPLY** means that one of the other determinants of supply (technology, resource prices, taxes or subsidies, expectations, and the price of other goods produced) has changed. In our example, resource prices went up so that less is supplied at each price. This shift could also be called a **DECREASE IN SUPPLY**.

One of the most important determinants of the position of the supply curve is the technology of production. Check out some facts about the technology, materials, and history of producing bluejeans at [Company L](#). Whoa, did you and Bob know how complicated this could be?? But you have a great idea for making each worker more productive, just a little change in the cutting machines they work with, a wee change in the organization of production, and output will soar. The supply curve? This **INCREASE IN SUPPLY** can be shown as a shift of the curve to the right, an increase in the amount you are willing to sell at each price.



The second supply diagram shows an **INCREASE IN SUPPLY**, where again the dark supply curve S2 is in the new position.

For Discussion

1. What happens to the supply curve today if your expectations about the price **next** month change so that you anticipate significantly higher prices at that time? Yes, it shifts--which way? Why?
2. What happens to the supply curve for bluejeans if the price of another good you produce with the SAME resources becomes significantly higher? Why?
3. Consider each of the determinants individually (one at a time): if that determinant increases, how does that affect the amount of the good that you offer for sale at a particular price?

Have you completed the demand analysis yet? If so, you are ready for the [self-quiz on demand and supply](#).

Explorations in Supply, Addendum to Part II (draft)

As promised, here is the more detailed cost analysis behind the supply curve. Consider the following hypothetical table showing various numbers of employees, the total labor cost assuming a wage of \$12 per hour, and the total output you expect these workers will produce:

# Employees	Tot Labr Cost/hr	Total Output	Marginal Output	Average Labor Cost	Marginal Labor Cost
Number	C	Q	Change in Q	C/Q	Ch. in C/Ch. in Q
10	120	20		\$6.00	
11	132	24	4	\$5.50	\$3.00
12	144	27	3	\$5.33	\$4.00
13	156	29	2	\$5.38	\$6.00
14	168	30	1	\$5.60	\$12.00

Remembering that these figures are hypothetical, let's take a look. The 11th person hired increases labor cost/hour to \$132 and output to 24 units. This is an average labor cost per unit (labor cost/output units) of \$5.50 and a marginal cost per unit, the addition to cost per unit of output (change in cost divided by change in output), of \$3.00. As more employees are added, both labor cost and output product rise. But at some point, because we are adding workers to a fixed size of plant and equipment, we find that adding one more worker does not increase output by as much. This is shown in the marginal product (or marginal returns) column by the falling marginal product.

The falling marginal product as labor is added shows the famous "*Law of Diminishing (Marginal) Returns.*" **As one more unit of a variable resource (labor) is added to a fixed resource (capital), beyond some point the additional (or marginal) output from the last unit of the variable resource will be lower.** Here is the basic point: beyond some number of employees, each additional person you hire adds to the level of production per hour, but adds less to production than the person hired just before. Since the last person costs just as much as the person before but doesn't add as much to production, your cost per unit of producing jeans rises. Whereas the 11th worker added \$3.00 to marginal cost per unit, adding the 14th worker adds \$12 to these marginal production costs. Would you be willing to hire this last person? Well, sure, if you could get the "right" price for the jeans! That's why it takes a higher price to induce you to supply more goods.

Of course, you will have other production costs also, since you must buy the materials for the jeans. If these other production materials cost a constant \$8 per pair, then adding \$8 to the marginal cost column should show the minimum price you'd be willing to accept for producing and selling various quantities of blue jeans. In other words, this would be your supply data!

Supply Data	
Price	Quantity
\$11.00	24
\$12.00	27
\$14.00	29
\$20.00	30

Now go back to Part II of the Supply Analysis to see the supply curve.